

Lecture 1

For Dr. Rasheed

Insulin and diabetes are very related to each other

لأن نقص الانسولين يسبب السكر

Insulin is a protein hormone secreted by B cells of islets of Langerhans of Pancreas

Cells of Islets of Langerhans are named A and B because the granules are named alpha and beta

Insulin is stored in the beta granules in B cells with zinc in the form of cystalles

Zinc is important in **storage** of insulin not function

كل واحدة زنك تمسك في 6 انسولين

Insulin : A chain 21 AA and B chain 30 AA

Connecting peptide connect A chain and B chain formed by 35 AA

Removal of 4 AA when removing the connecting peptide by trypsin like enzyme

C-chain فيه فرق بين و connecting peptide

C chain = (connecting peptide – 4 AA) = 31 AA

A and B chains are interconnected with interchain (**between** the two chains) disulfide bonds

#20 AA in A chain with #19 AA in B chain

#7 AA in A chain with #7 AA in B chain

There is **Intrachain** disulfide bond in A chain between # 6 AA and #4 AA

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Preproinsulin = insulin + connecting peptide + leading peptide

Preproinsulin is formed in ribosomes

Proinsulin is formed in endoplasmic reticulum

Insulin is then formed with C peptide in golgi apparatus then packed in beta granules of B cells

leading peptide is named leading because it leads the peptide chain through the endoplasmic reticulum

the secretion is insulin and C peptide in an **equimolar** amount نفس عدد الموليكيولز because proinsulin is cleaved into insulin and C peptide

there's also a little proinsulin secreted

C peptide is **significantly** used to know the amount of insulin secreted by the pancreas

عشان لو بقيس الانسولين ممكن يكون جاي من برة

Unit of insulin : الكمية اللي تقلل السكر في الدم من 120 ل 45 في أرنب وزنه 2 كيلو

اخترعنا الطريقة دي عشان نقيس حاجات كميتها قليلة جدا في الجسم

50 units is secreted daily and **depends on** CHO feeding state

250 units are formed daily

Glucose is main stimulus for insulin secretion

When Blood glucose =70 insulin start to be secreted

Blood glucose 300-500 maximum amount is secreted

Calcium when increases the insulin secretion increases

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Glucose enters B cells by **GLUT 2** → metabolism → ATP increase → ATP sensitive K channels closes → depolarisation → Calcium enters → insulin is secreted

Insulin is important for amino acids uptake (**anabolic effect**)

Increased epinephrine for long time causes diabetes

Sulfonylurea group drugs closes K channels so increase insulin secretion

Half life = time in which concentration of insulin is halved = 5 mins

Glutathione insulin transhydrogenase catabolise insulin in liver

4 GSH molecules are needed to catabolise 1 molecule insulin

Insulin binds to cell surface receptor formed of 2 small alpha chains outside the cells and 2 transmembrane beta chain

Autophosphorylation of beta chains on tyrosine residues occurs when insulin binds to alpha chains by protein tyrosine kinase activity and phosphorylation of insulin receptor substrate

Insulin increases cell proliferation , protein synthesis and cell differentiation

Diabetes mellitus

Diabetes = increased volume of urine

Mellitus = glucose in urine

It's a Syndrome which has many symptoms : hyperglycemia , glucosuria , polyuria(كثير الحمام بيخش), dehydration , polydipsia(كثير بيعطش), polyphagia(بيجوع) , loss of weight

Primary diabetes : insulin deficiency or resistance

Secondary diabetes : increased anti insulin hormones

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Insulin deficiency is more dangerous than insulin resistance

Insulin resistance = استجابة الشخص للانسولين أقل من الطبيعي و لا تعني أن الشخص لا يستجيب له

Diabetes is the second worldwide disease it affects 3-10% of population

Obesity is the first

Gestational diabetes is a type of type 2 diabetes

Pregnancy is considered as stress and increase requirement of insulin so it causes diabetes

After pregnancy maybe the diabetes disappears and maybe no

Bronze diabetes excessive load of iron deposit iron on B cells of pancreas and causes pigmentation of skin